

# STIC Search Report

## STIC Database Tracking Num

To:

Laura Schillinger

Location:

Hotelling

Date:

March 7, 2007

Art Unit:

2813

Serial Number: 10/603418

From:

Diane Jackson

Location: EIC 2800

JEF:

4B68

Phone:

571-272-2540

diane.jackson@uspto.gov

## **Search Notes**

Attached are litigation search results in Lexis Nexis, and CourtLink and Questel-Orbit.

No Litigation was found for Serial Number 10/603418 (Patent Number 5904549).

If you have any questions, please feel free to contact me.

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Diane



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Patent Search 5904549 3/7/2007

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Source: Combined Source Set 10 ii - Utility, Design and Plant Patents Terms: patno=5904549 (Edit Search | Suggest Terms for My Search)

834959 (08) 5904549 May 18, 1999

#### UNITED STATES PATENT AND TRADEMARK OFFICE GRANTED PATENT

#### 5904549

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## Order Patent File History / Wrapper from REEDFAX® Link to Claims Section

May 18, 1999

Methods for growing semiconductors and devices thereof from the alloy semiconductor GaInNAs

REISSUE: May 17, 2001 - Reissue Application filed Ex. Gp.: 2813; Re. S.N. 09/860,369 (O.G. August 21,

June 24, 2003 - Reissue Application filed Ex. Gp.: 2813; Re. S.N. 10/603,418 (O.G. July 27, 2004)

**INVENTOR:** Sato, Shunichi - Miyagi-ken, Japan (JP)

**APPL-NO:** 834959 (08)

FILED-DATE: April 7, 1997

GRANTED-DATE: May 18, 1999

**PRIORITY:** April 11, 1996 - 8114177, Japan (JP)

ASSIGNEE-PRE-ISSUE: October 22, 1997 - ASSIGNMENT OF ASSIGNORS INTEREST (SEE DOCUMENT FOR DETAILS)., RICOH COMPANY, LTD. 3-6, NAKAMAGOME 1-CHOME, OHTA-KUTOKYO 143, (1), Reel and

Frame Number: 008798/0190

ASSIGNEE-AT-ISSUE: Ricoh Company, Ltd., Tokyo, Japan (JP), Foreign company or corporation (03)

LEGAL-REP: Cooper & Dunham LLP

PUB-TYPE: May 18, 1999 - Utility Patent having no previously published pre-grant publication (A)

**PUB-COUNTRY:** United States (US)

**US-MAIN-CL:** 438#478

US-ADDL-CL: 257#E21.108, 438#46

**CL:** 438, 257, 438

**SEARCH-FLD:** 438#45, 438#46, 438#47, 438#478

**IPC-MAIN-CL:** [6] H01L 21/#30

PRIM-EXMR: Chaudhari; Chandra

## Query/Command: prt ful legalall max

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1/1 FAMPAT - @QUESTEL-ORBIT - image
           20042781773849
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PN
            D JP9283857 A 19971031 [JP09283857]
                     STG: Doc. Laid open to publ. Inspec.
                     AP: 1996JP-0114177 19960411
            図 US5904549 A 19990518 [US5904549]
                     STG: United States patent
                     AP: 1997US-0834959 19970407
           Methods for growing semiconductors and devices thereof from the alloy semiconductor
TI
           GaInNAs
PA
           RICOH KK
PA0
           Ricoh Company, Ltd., Tokyo [JP]
IN
           SATO SHUNICHI
PR
           1996JP-0114177 19960411
           C30B-025/02
IC
           H01L-021/02
           H01L-021/205
           H01L-021/30
           H01L-033/00
           H01S-003/18
ICAA -
          C30B-025/02 [2006-01 A - I R M EP]; H01L-021/205 [2006-01 A - I R M EP]
ICCA -
           C30B-025/02 [2006 C - I R M EP]; H01L-021/02 [2006 C - I R M EP]
EC
           C30B-025/02 C30B-029:40
PCL
           ORIGINAL (O): 438478000; CROSS-REFERENCE (X): 257E21108 438046000
FI
           H01L33/00 C; H01L21/205; H01S3/18; H01S5/00
FTM
           5F041 AA31; 5F041 AA40; 5F041 CA04; 5F041 CA05; 5F041 CA34; 5F041 CA35; 5F041
           CA36; 5F041 CA49; 5F041 CA53; 5F041 CA57; 5F041 CA65; 5F045 AA04; 5F045 AB17;
           5F045 AB18; 5F045 AC01; 5F045 AC07; 5F045 AC08; 5F045 AC09; 5F045 AC19; 5F045
           CA10; 5F045 CA12; 5F045 DA52; 5F045 GA02; 5F045 GA03; 5F073 AA74; 5F073 CA07;
           5F073 CA17; 5F073 CA18; 5F073 CB04; 5F073 CB13; 5F073 DA05; 5F073 EA29; 5F045
           EE11; 5F045 EK25; 5F045 GB05; 5F045 GB06; 5F045 GB07; 5F045 DA03; 5F045 AB19;
           5F045 AD08; 5F045 AD09; 5F045 AD10; 5F045 AD11; 5F045 AE25; 5F045 AF03; 5F045
           AF04; 5F045 BB16; 5F045 DA55; 5F045 DP07; 5F045 EC05; 5F045 EE12; 5F045 EJ04;
           5F045 EJ09; 5F045 EK03; 5F045 EM09; 5F173 AH04; 5F173 AP06; 5F173 AO12; 5F173
           AQ14; 5F173 AR14; 5F173 AR75
CT
           (US5904549)
           M. Kondow et al., "GaInNAs: a novel material for long-wavelength semiconductor lasers",
           IEEE Journal of Selected Topics in Quantum Electronics, vol. 3, No. 3, pp. 719-730, Jun.
           1997.
CT
           (JP09283857)
           [19] Citation as reason for refusal of an application
           JP (A) 1996222764 [JP08222764]
           JP (A) 1995240373 [JP07240373]
           JP (A) 1995154023 [JP07154023]
AB
           (US5904549)
           A method is disclosed for growing a nitrogen-containing III-V alloy semiconductor on a
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semiconductor substrate such as GaAs, which is formed by MOCVD method using nitrogen containing organic compounds having relatively low dissociation temperatures. The alloy

semiconductor has a high nitrogen content which exceeds the contents previously achieved, and has a high photoluminescence intensity. There are also disclosed fabrications of semiconductor devices comprising the alloy semiconductors, such as heterostructure and homo-junction light emitting devices.

## **OBJ** - (US5904549)

This invention relates in general to semiconductors and semiconductor devices and more particularly, to methods for growing nitrogen-containing alloy semiconductors and semiconductor devices such as semiconductor lasers and light emitting diodes comprising the alloy semiconductors.

Another object of the invention is to provide methods for growing III-V alloy semiconductors having a high nitrogen concentration and to provide semiconductor devices comprising the alloy semiconductors.

According to an aspect of the present invention, there is provided a method for growing an alloy semiconductor on a semiconductor substrate, having at least one layer of III-V alloy semiconductor comprised of a plurality of group V elements including at least nitrogen and arsenic simultaneously.

According to yet another aspect of the invention, there is provided a method for growing nitrogen-containing III-V alloy semiconductors, using nitrogen-containing organic compounds as source materials for nitrogen, such as dimethylhydrazine (DMHy) and tertiary butyl amine (TBA), which have improved properties such as low dissociation temperatures and high vapor pressures, thereby leading to growths of alloy semiconductors of excellent quality for the use of light emitting devices.

According to another aspect of the invention, there is provided a method for growing nitrogen-containing III-V alloy semiconductors on a semiconductor substrate, and controlling conductive properties of, and carrier concentrations in the alloy semiconductors by adding appropriate dopants such as selenium for n-type, and group II element such as zinc or magnesium for p-type.

## ADB - (US5904549)

This causes difficulties in obtaining nitrogen-containing III-V alloy semiconductors with a large concentration of nitrogen.

This results in an undesirable increase in concentrations of arsenic vacancies and makes it difficult to grow nitrogen-containing III-V alloy semiconductor of satisfying quality. As a result, these methods are not able to provide nitrogen-containing alloy semiconductors of excellent quality.

# **ICLM** - (US5904549)

- 1. A method for growing at least one layer of III-V alloy semiconductor on a semiconductor substrate, and including at least nitrogen and arsenic simultaneously, comprising forming said alloy semiconductor by a conventional low pressure MOCVD method, using a nitrogen containing organic compound as a source material for nitrogen and AsH3 for arsenic, wherein said III-V alloy semiconductor comprises GaInNAs.
- 5. A method for growing at least one layer of III-V alloy semiconductor on a GaAs substrate, and including at least nitrogen and arsenic simultaneously, comprising forming said alloy semiconductor by a conventional low pressure MOCVD method under specified conditions of temperatures and pressures, using a nitrogen containing organic compound as a source material for nitrogen and AsH3 for arsenic, wherein said III-V alloy semiconductor comprises GaInNAs.
- 10. A method for growing at least one layer of III-V alloy semiconductor on a GaAs substrate, and including at least nitrogen and arsenic simultaneously, comprising: forming said alloy semiconductor by a conventional low pressure MOCVD method, using a nitrogen containing organic compound as a source material for nitrogen and AsH3 for arsenic, under conditions such as a partial pressure of said AsH3 in a reactor of equal to or more than 2 Pa and a temperature of said semiconductor substrate of equal to or more than 550 (degree) C., wherein said III-V alloy semiconductor comprises GaInNAs.

13. A method for growing at least one layer of III-V alloy semiconductor on a GaAs substrate, and including at least nitrogen and arsenic simultaneously, comprising: forming said alloy semiconductor by a conventional low pressure MOCVD method using a nitrogen containing organic compound as a source material for nitrogen and AsH3 for arsenic, under conditions such as a partial pressure of said AsH3 in a reactor of equal to or more than 10 Pa and a temperature of said semiconductor substrate of equal to or more than 600 (degree) C., wherein said III-V alloy semiconductor comprises GaInNAs. 16. A method for fabricating a semiconductor device, having at least one layer of a III-V alloy semiconductor on a GaAs substrate, comprised of a plurality of group V elements including at least nitrogen and arsenic simultaneously, comprising: forming said alloy semiconductor by a conventional low pressure MOCVD method, using a nitrogen containing organic compounds as a source material for nitrogen and AsH3 for arsenic, under conditions such as a partial pressure of said AsH3 in a reactor of equal to or more than 2 Pa and a temperature of said semiconductor substrate of equal to or more than 550 (degree) C., wherein said III-V alloy semiconductor comprises GaInNAs. 19. A method for fabricating a semiconductor device, having at least one layer of a III-V alloy semiconductor on a GaAs substrate, comprised of a plurality of group V elements including at least nitrogen and arsenic simultaneously, comprising: forming said alloy semiconductor by a conventional low pressure MOCVD method using a nitrogen containing organic compound as a source material for nitrogen and AsH3 for arsenic, under conditions such as a partial pressure of said AsH3 in a reactor of equal to or more than 10 Pa and a temperature of said semiconductor substrate of equal to or more than 600 (degree) C.

UP - 2000-08

1/1 LGST - ©EPO

PN - 🔁 US5904549 A 19990518 [US5904549]

AP - US83495997 19970407 [1997US-0834959]

ACT - 19971022 US/AS02-A

ASSIGNMENT OF ASSIGNOR'S INTEREST

OWNER: RICOH COMPANY, LTD. 3-6, NAKAMAGOME 1-CHOME, OHTA-;

**EFFECTIVE DATE: 19970508** 

19971022 US/AS02-A

ASSIGNMENT OF ASSIGNOR'S INTEREST

OWNER: SATO, SHUNICHI; EFFECTIVE DATE: 19970508

20010821 US/RF-A

REISSUE APPLICATION FILED

**EFFECTIVE DATE: 20010517** 

20040727 US/RF-A

REISSUE APPLICATION FILED

20040824 US/ERR-A

**ERRATUM** 

IN THE REISSUE NOTICE, FOR PATENT NUMBER 5904549, APPEARING IN THE OFFICIAL GAZETTE ON 20040727, THE FILING DATE WAS OMITTED. THE FILING

DATE IS 20030624.

**UP** . - 2004-38

1/1 CRXX - ©CLAIMS/RRX

AN - 3148887

PN - 🔁 5,904,549 A 19990518 [US5904549]

PA - Ricoh Co Ltd JP

PT - CM (Chemical Mechanical)

ACT - 20010517 REISSUE REQUESTED ISSUE DATE OF O.G.: 20010821

REISSUE REQUEST NUMBER: 09/860369

**EXAMINATION GROUP RESPONSIBLE FOR REISSUEPROCESS: 2813** 

### Reissue Patent Number:

20040727 REISSUE REQUESTED ISSUE DATE OF O.G.: 20040727

REISSUE REQUEST NUMBER: 10/603418

**EXAMINATION GROUP RESPONSIBLE FOR REISSUEPROCESS: 2813** 

## Reissue Patent Number:

UP - 2001-34

**UACT** - 2004-07-27

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## Extended Family Search Results

## US5904549/PN Results: 2

#### PATENT FAMILY

#	Patent No.	Kind	Date	Applic.No.	Date
1)	JP09283857	Α	19971031	1996JP-0114177	19960411
2)	US5904549	Α	19990518	1997US-0834959	19970407

Priority:

1996JP-0114177

19960411

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PN - 🗓 JP9283857 A 19971031 [JP09283857]

STG - (A) Doc. Laid open to publ. Inspec.

TI - (A) SEMICONDUCTOR MANUFACTURING METHOD AND SEMICONDUCTOR ELEMENT

PA - (A) RICOH KK

PA0 - (A) RICOH CO LTD

IN - (A) SATO SHUNICHI

IC - (A) H01L-021/205 H01L-033/00 H01S-003/18

**AP** - JP11417796 19960411 [1996JP-0114177]

PR - JP11417796 19960411 [1996JP-0114177]

ICAA - C30B-025/02 [2006-01 A - I R M EP]; H01L-021/205 [2006-01 A - I R M EP]

ICCA - C30B-025/02 [2006 C - I R M EP]; H01L-021/02 [2006 C - I R M EP]

FI - H01L33/00 C; H01L21/205; H01S3/18; H01S5/00

FTM - 5F041 AA31; 5F041 AA40; 5F041 CA04; 5F041 CA05; 5F041 CA34; 5F041 CA35; 5F041 CA36; 5F041 CA49; 5F041 CA53; 5F041 CA57; 5F041 CA65; 5F045 AA04; 5F045 AB17; 5F045 AB18; 5F045 AC01; 5F045 AC07; 5F045 AC08; 5F045 AC09; 5F045 AC19; 5F045 CA10; 5F045 CA12; 5F045 DA52; 5F045 GA02; 5F045 GA03; 5F073 AA74; 5F073 CA07; 5F073 CA17; 5F073 CA18; 5F073 CB04; 5F073 CB13; 5F073 DA05; 5F073 EA29; 5F045 EE11; 5F045 EK25; 5F045 GB05; 5F045 GB06; 5F045 GB07; 5F045 DA03; 5F045 AB19; 5F045 AD08; 5F045 AD09; 5F045 AD10; 5F045 AD11; 5F045 AE25; 5F045 AF03; 5F045 AF04; 5F045 BB16; 5F045 DA55; 5F045 DP07; 5F045 EC05; 5F045 EE12; 5F045 EJ04; 5F045 EJ09; 5F045 EK03; 5F045 EM09; 5F173 AH04; 5F173 AP06; 5F173 AQ12; 5F173 AQ14; 5F173 AR14; 5F173 AR75

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2/2 PLUSPAT - @QUESTEL-ORBIT - image

PN - 🔁 US5904549 A 19990518 [US5904549]

STG - (A) United States patent

TI - (A) Methods for growing semiconductors and devices thereof from the alloy semiconductor GaInNAs

PA - (A) RICOH KK (JP)

PA0 - Ricoh Company, Ltd., Tokyo [JP]

IN - (A) SATO SHUNICHI (JP)

IC - (A) H01L-021/30

AP - US83495997 19970407 [1997US-0834959]
PR - JP11417796 19960411 [1996JP-0114177]

ICAA - C30B-025/02 [2006-01 A - I R M EP]; H01L-021/205 [2006-01 A - I R M EP]

ICCA - C30B-025/02 [2006 C - I R M EP]; H01L-021/02 [2006 C - I R M EP]

**EC** - C30B-025/02 C30B-029:40

PCL - ORIGINAL (O): 438478000; CROSS-REFERENCE (X): 257E21108 438046000

DT - Basic

## 1/1 LEGALI-@EPO

PN - US5904549 A 19990518 [US5904549]

AP - US83495997 19970407 [1997US-0834959]

ACT - 19971022 US/AS02-A

ASSIGNMENT OF ASSIGNOR'S INTEREST

OWNER: RICOH COMPANY, LTD. 3-6, NAKAMAGOME 1-CHOME, OHTA-;

**EFFECTIVE DATE: 19970508** 

19971022 US/AS02-A

ASSIGNMENT OF ASSIGNOR'S INTEREST

OWNER: SATO, SHUNICHI; EFFECTIVE DATE: 19970508

20010821 US/RF-A

REISSUE APPLICATION FILED EFFECTIVE DATE: 20010517

20040727 US/RF-A

REISSUE APPLICATION FILED

20040824 US/ERR-A

**ERRATUM** 

IN THE REISSUE NOTICE, FOR PATENT NUMBER 5904549, APPEARING IN THE OFFICIAL GAZETTE ON 20040727, THE FILING DATE WAS OMITTED. THE FILING

DATE IS 20030624.

**UP** - 2004-38

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Table Of Contents Source: Legal > Federal Legal - U.S. > United States Code Service (USCS) Materials > United States Code Service - Titles 1 through United States Code Service - Titles 1 through 50 5904549 or 5,904,549 Search: Full-text of source documents 🔑 Search C Table of Contents (TOC) only Search Selected Only Clear All Selections | Hide Book Headers ⊕ ☐ TITLE 1. GENERAL PROVISIONS ⊕ ☐ TITLE 2. THE CONGRESS ⊕ ☐ TITLE 3. THE PRESIDENT ⊕ ☐ TITLE 4. FLAG AND SEAL, SEAT OF GOVERNMENT, AND THE STATES ⊕ ☐ TITLE 5. GOVERNMENT ORGANIZATION AND EMPLOYEES **⊕** ☐ TITLE 6. DOMESTIC SECURITY ⊕ ☐ TITLE 7. AGRICULTURE ★ ☐ TITLE 8. ALIENS AND NATIONALITY ⊕ ☐ TITLE 9. ARBITRATION ⊕ ☐ TITLE 10. ARMED FORCES ⊕ ☐ TITLE 11. BANKRUPTCY ⊕ ☐ TITLE 12. BANKS AND BANKING ⊕ TITLE 13. CENSUS **⊕ ☐** TITLE 14. COAST GUARD ⊕ ☐ TITLE 15. COMMERCE AND TRADE **⊕** ☐ TITLE 16. CONSERVATION **⊕** ☐ TITLE 17. COPYRIGHTS ⊕ ☐ TITLE 18. CRIMES AND CRIMINAL PROCEDURE ⊕ [∷TITLE 19. CUSTOMS DUTIES ⊕ ☐ TITLE 20. EDUCATION **⊕** ☐ TITLE 21. FOOD AND DRUGS ⊕ ☐ TITLE 22. FOREIGN RELATIONS AND INTERCOURSE ⊕ I TITLE 23. HIGHWAYS ⊕ ☐ TITLE 24. HOSPITALS AND ASYLUMS ① TITLE 25. INDIANS TITLE 26. INTERNAL REVENUE CODE ⊕ ☐ TITLE 27. INTOXICATING LIQUORS ⊕ ☐ TITLE 28. JUDICIARY AND JUDICIAL PROCEDURE 🕀 🗀 TITLE 29. LABOR ★ TITLE 30. MINERAL LANDS AND MINING **⊕** ☐ TITLE 31. MONEY AND FINANCE ⊕ ☐ TITLE 32. NATIONAL GUARD **⊕** ☐ TITLE 33. NAVIGATION AND NAVIGABLE WATERS ⊕ ☐ TITLE 34. [NAVY] ⊕ ☐ TITLE 35. PATENTS TITLE 36. PATRIOTIC AND NATIONAL OBSERVANCES, CEREMONIES, AND ORGANIZATIONS lacktriangledown Title 37. Pay and allowances of the uniformed services  $oldsymbol{+}$  ★ TITLE 38. VETERANS' BENEFITS ⊕ TITLE 39. POSTAL SERVICE ⊕ ☐ TITLE 40. PUBLIC BUILDINGS, PROPERTY, AND WORKS ① ITTLE 41. PUBLIC CONTRACTS ☐ TITLE 42. THE PUBLIC HEALTH AND WELFARE

⊕ ☐ TITLE 43. PUBLIC LANDS

TITLE 45. RAILROADS ⊕ ☐ TITLE 46. SHIPPING

⊕ ☐ TITLE 44. PUBLIC PRINTING AND DOCUMENTS

⊕ ☐ TITLE 47. TELEGRAPHS, TELEPHONES, AND RADIOTELEGRAPHS

- ⊕ ☐ TITLE 48. TERRITORIES AND INSULAR POSSESSIONS
- **④** ☐ TITLE 49. TRANSPORTATION

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Source: Combined Source Set 1 i - News, All (English, Full Text)

Terms: (5904549 or 5,904,549) (Edit Search | Suggest Terms for My Search)

Prada Tokyo's Canadian connection Prada's store in Tokyo is notable not only for its crystalline architecture but also for the light show that turns the building into a pulsating organic presence, giving it an identity uniquely its own Canadian Interiors December, 2003

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December, 2003

**SECTION:** v.40(6) N/D'03 pg 56; ISSN: 0008-3887

CBCA-ACC-NO: 5904549

LENGTH: 840 words

**HEADLINE:** Prada Tokyo's Canadian connection Prada's store in Tokyo is notable not only for its crystalline architecture but also for the light show that turns the building into a pulsating organic presence, giving it an identity uniquely its own

BYLINE: Sobchak, Peter

#### **BODY**:

The new Prada flagship store in the Aoyama district of Tokyo, designed by Swiss architects Jacques Herzog and Pierre de Meuron, has attracted international attention since it opened last spring. London's Observer called it "a beautiful building, put together with the finesse of Japanese craftsmanship and Swiss determination."

Crowds of visitors trek to the site to see not only the building itself, but what's going on inside, at all hours. The interior appears to pulsate, shift and oscillate. In places it seems like organs are beating to a rhythm of their own, turning the cold crystalline structure into an organic, living being. To create this dramatic effect, Herzog and de Meuron turned to Derivative Inc., a Toronto computer software design company, co-founded by Greg Hermanovic.

"We were approached about a year ago when they were considering how to implement the concept of projecting onto some of their surfaces," says Hermanovic. "Hyperwerk (of Basel, Switzerland) was subcontracted to work on the in-store electronics, and found Derivative through an Internet search."

Light shows and projections are not new concepts in the world of retail presentation or interior design. But to better understand the unique nature of those at Prada Tokyo, it helps to know where they come from.

"I've always been interested in two things: motion and graphics," Hermanovic says. Trained as a physicist and engineer, he worked on a simulator for the U.S. Space Shuttle's CanadArm robotic manipulator, as well as programming aircraft simulators and participating in a U.N. global weather research project.

In 1987, he co-founded Side Effects Software, out of which came Houdini, a 3D special effects software used in over 150 feature films including the Matrix and Titanic. The contribution Side Effects' software has made to

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